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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/783,562	02/19/2004	William W. Feng	LSTC-004	7548

37804 7590 11/29/2006

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EXAMINER	
OCHOA, JUAN CARLOS	

ART UNIT	PAPER NUMBER
2123	

DATE MAILED: 11/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/783,562	FENG,ET AL.	
	Examiner	Art Unit	
	Juan C. Ochoa	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *21-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *21-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 July 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 21–40 are presented for examination.

Claim Objections

2. Claims 37 and 38 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. As per claim 36, the subject matter is a system.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 21–27, 29, and 31–34 and 36–39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nonlinear FEA of Elastomers-MSC Technical Paper, MSC Software, (MSC hereinafter), taken in view of Gallagher et al., (Gallagher hereinafter), An Efficient 3-D Visualization Technique for Finite Element Models and Other Coarse Volumes.

7. As to claim 21, MSC discloses a method for simulating structural responses of a compressible material in finite element analysis (see page 3, col. 1, lines 1–6), the method comprising: defining a plurality of finite elements and a strain-stress curve to represent the compressible material (see page 6, col. 2, 3rd paragraph to end of col. 3); calculating a plurality of stress function f(λ) values, wherein each of the plurality of stress function values equals to summation of a sequence of $\lambda^{(-v)^j}\ \sigma_o(\lambda^{(-v)^j})$ (see page 7, col. 3, 3rd paragraph from the bottom and/or page 8, col. 1, 1st and 2nd paragraphs), where j is an integer related to j-th term of the sequence, λ is a particular stretch ratio of interest (see page 6, col. 2, 1st and 2nd paragraphs), v is Poisson's ratio of the

compressible material (see page 8, col. 2), and $\sigma_o(\lambda^{(-v)^j})$ is the stress value at $\lambda^{(-v)^j}$ defined by stress-strain curve for the compressible material.

8. While MSC discloses a method for simulating structural responses of a compressible material in finite element analysis, MSC lacks fails to disclose predict teach storing the plurality of stress function values into a lookup table and evaluating element stresses in a local coordinate system from the lookup table in accordance with a set of principal stretches at each integration point of each of the finite elements.

9. Gallagher discloses storing the plurality of stress function values into a lookup table (see page 187, col. 1, 2nd paragraph); and evaluating element stresses in a local coordinate system from the lookup table in accordance with a set of principal stretches at each integration point of each of the finite elements (see page 191, col. 1, 5th paragraph).

10. MSC and Gallagher are analogous art because they are both related to finite element models.

11. Therefore, it would have been obvious to one of ordinary skill in this art at the time of invention by applicant to utilize the lookup tables of Gallagher in the method of MSC because Gallagher develops a technique that extends existing 3-D result visualization methods for use with finite element models, where result values are only available at coarsely spaced points throughout the volume, which represents results as smooth isosurfaces within the volume for one or more result values, using visually continuous, bi-cubic polynomials (see page 185, col. 1, 1st paragraph), and as a result, Gallagher reports the following improvement over his prior art: reducing the

computational and display bandwidth of general 3-D solid visualization problems (see page 192, conclusion, 2nd paragraph).

12. As to claim 22, MSC discloses a method wherein the stress-strain curve is obtained from a physical experiment of the compressible material under a uni-axial loading condition (see "uniaxial stress-strain" in page 15, col. 2, last paragraph).

13. As to claim 23, MSC discloses a method wherein the stretch ratio is a ratio between deformed length divided by original length of the compressible material in one direction (see page 6, col. 2, 1st paragraph).

14. As to claim 24, a method wherein the sequence has a total of m terms, and m is a positive integer, and the term of the sequence starts from 0 to m-1 (manipulation of mathematical concepts).

15. As to claim 25, a method wherein said calculating step is completed when absolute value of $|\lambda^{(-v)^{\wedge}j} - 1|$ is less than a threshold (manipulation of mathematical concepts).

16. As to claim 26, a method wherein the threshold is defined as 0.01 (manipulation of mathematical concepts).

17. As to claim 27, MSC discloses a method wherein the element stresses include nominal stress and true stress (see "nominal stress" as "Engineering stress" in page 6, col. 3, 2nd paragraph and "true stress" as "Cauchy stress" in page 6, col. 2, last paragraph).

18. As to claim 29, Gallagher discloses a method said evaluating element stresses in local coordinate system further includes interpolating the lookup table to obtain the element stresses at the principal stretches (see page 189, col. 1, 3rd paragraph).

19. As to claims 31–34 and 36–39, these claims recite a computer program product and a system for performing the method of claims 21–27 and 29. MSC discloses a program (see page 4, col. 1, 1st paragraph) for performing a method that teaches claims 21–27 and 29. Therefore, claims 31–34 and 36–39 are rejected for the same reasons given above.

20. Claims 28, 30, 35, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over MSC, taken in view of Gallagher as applied to claims 21, 31, and 36 above, and further in view of Peric et al., (Peric hereinafter), Finite-Element Applications to the Non-linear Mechanics of Solids.

21. As to claim 28, while the MSC–Gallagher method teaches simulating structural responses of a compressible material in finite element analysis, the MSC–Gallagher method fails to teach the set of principal stretches is obtained by solving eigensolution for deformation gradient tensor at each integration point of each of the finite element.

22. Peric discloses a method wherein the set of principal stretches is obtained by solving eigensolution for deformation gradient tensor at each integration point of each of the finite element (see page 1515, Remark 4.2, lines 1–4).

23. MSC, Gallagher, and Peric are analogous art because they are related to finite element models.

24. Therefore, it would have been obvious to one of ordinary skill in this art at the time of invention by applicant to utilize the disclosure of Peric in the MSC–Gallagher method because Peric discusses some of the relevant computational advances which permit the simulation of large-scale problems involving nonlinear solids within realistic time frames and computational resources (see page 1495, Abstract, lines 1–3), and as a result, Peric reports a comparison of performances of three algorithms, in the solution of the algebraic system of equations: profile (direct) solver, Bi-CGStab iterative solution and multigrid. Peric shows that it is clear that both the Bi-CGStab and multigrid solution provide a significant improvement over the standard direct solver, (i.e. improvements over prior art), since memory requirements and CPU time have both been reduced by approximately 7–8 times in comparison with the direct solution; Peric also shows that in comparison with the Bi-CGStab solution, the multigrid strategy requires some small additional storage, but shows almost twofold reduction in the CPU time (see page 1570, figure 43(a) and page 1569, 3rd paragraph).

25. As to claim 30, Peric discloses a method further comprises transforming the element stresses to global coordinate system (see page , col. , next to last paragraph, lines).

26. As to claims 35 and 40, these claims recite a computer program product and a system for performing the method of claim 30. MSC discloses a program (see page 4, col. 1, 1st paragraph) for performing a method that teaches claim 30. Therefore, claims 35 and 40 are rejected for the same reasons given above.

Conclusion

27. Examiner would like to point out that any reference to specific figures, columns and lines should not be considered limiting in any way, the entire reference is considered to provide disclosure relating to the claimed invention.

28. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan C. Ochoa whose telephone number is (571) 272-2625. The examiner can normally be reached on 7:30AM - 4:00 PM.

29. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached on (571) 272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

30. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

*** JO 11/27/06

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11/27/06